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Bureau of Air, Permit Section
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Project Summary
For a Construction Permit Application
From MGP Ingredients of Illinois, Pekin,
For a New Feed Drying System

Site Identification No.: 179060AAD
Application No.: 04060009
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Schedule

Public Comment Period Begins: December 17, 2005
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Illinois EPA Contacts

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I. INTRODUCTION

MGP Ingredients of Illinois, Inc., (MGP) has requested a construction permit for a new feed drying system at its Pekin manufacturing complex. The new drying system would include combustion control for organic emissions and replace two existing feed dryers installed in the mid 1980's that lack such control.

II. PROJECT DESCRIPTION

MGP processes grain and wheat flour to produce beverage and fuel ethanol, animal feed, wheat gluten, and wheat starch. MGP has requested a construction permit for a new gas fired feed drying system. Ethanol plants use feed dryers to reduce the moisture content of the protein-rich material that remains after making ethanol to produce dry cattle feed, which can be stored for extended periods of time and transported long distances.

MGP plans to install a new Eco-Dry™ feed drying system in which combustion control of emissions is integral to the operation of the dryer. The system would be similar to the new Eco-Dry™ feed drying system installed by MGP in 2002. In this type of feed drying system, a heat exchanger is used to heat air to approximately 850 °F for use in the dryer unit. This hot air is a combination of fresh air and recirculated air from the dryer unit, which is already warm. The burner is at the end of the system and the combustion air for the burner is the exhaust gas from the dryer unit that is not being recirculated. In addition, the exhaust from the feed cooler, which follows the dryer unit, also goes to the burner for use as combustion air. As a result, all emissions from the dryer and cooler units pass through the burner before being discharged to the atmosphere. This provides control of emissions of volatile organic material (VOM) and final control of the particulate matter (PM) emissions from these units.

As well as providing combustion control for emissions, MGP has indicated that it selected this dryer system because it provides good thermal efficiency. This is achieved because the heated air is recirculated through the dryer several times. The actual discharge to the atmosphere is a fraction of the hot air circulating through the dryer and is determined by the need to maintain a level of moisture in the air in the dryer at which drying can effectively take place.

The new dryer system would be preceded by a mixer, in which the wet material remaining after ethanol production (about 70 percent moisture), would be mixed with material that had already been dried. This reduces the moisture content of the input to the dryer by more than half, to a range at which drying can be effectively carried out.

Actual drying of feed would occur in the dryer unit, which would be followed by cyclone-type control devices to collect particulate matter entrained in the gaseous exhaust from the dryer. Most of the dried feed from the dryer would be returned to the mixer to be combined with more wet material.

The actual feed product from the dryer unit would go to the feed cooler, where the temperature of the feed product is lowered for storage. Cooling would be accomplished by blowing fresh air from outdoors into the feed in a cooling vessel designed to minimize

entrainment of dust. The cooler would be followed by a cyclone-type control device to collect the particulate entrained in the exhaust from the cooler. The cooler would be one point at which fresh air would be introduced into the drying system.

The flow of the gaseous exhaust from the dryer unit, after passing through the cyclones for particulate matter control, would be split. As already explained, most of the exhaust would be recirculated back to the dryer unit. The remainder of the exhaust would go to the burner as combustion air. However, this exhaust flow to the burner would first pass through a waste heat evaporator. The waste heat evaporator is a multi-stage heat exchanger used to drive off water and concentrate thin stillage, converting it into syrup. This device productively recovers more of the energy value in the dryer exhaust, while also lowering its moisture content by cooling it so some of the water condenses.

As already explained, the gas-fired burner, which supplies the hot air for the dryer unit through the heat exchanger, would have two sources of combustion air, the exhaust from the cooler and the exhaust from the dryer that is not recirculated. To make up for the "loss" of dryer exhaust to the burner, fresh air would be added to the recirculated air passing through the heat exchanger. After passing through the heat exchanger, the exhaust from the burner would be discharged to the atmosphere through a 115 foot tall stack.

III. PROJECT EMISSIONS

The potential or permitted annual emissions of the new feed drying system, as would be allowed by the draft permit, are summarized below. Actual emissions will be less than the permitted emissions to the extent that the new dryer system would operate at less than its maximum capacity and normally operates to achieve emission rates that are lower than the applicable standards and limitations.

<u>Permitted Annual Emissions of the Project (Tons/Year)</u>					
<u>PM</u>	<u>PM10*</u>	<u>VOM</u>	<u>SO₂</u>	<u>NO_x</u>	<u>CO</u>
8.8	17.1	39.4	39.4	39.4	43.8

* PM10 including condensable particulate as measured by USEPA Method 202.

IV. APPLICABLE EMISSION STANDARDS

The application shows that the proposed drying system will readily comply with applicable state emission standards, as set forth at 35 Ill. Adm. Code: Subtitle B.

The proposed drying system will also readily comply with the federal National Emissions Standard for Hazardous Air Pollutant (NESHAP) for Industrial, Commercial, and Institutional Boilers and Process Heaters 40 CFR 63, Subpart DDDDD. For purposes of these standards, the new feed drying system is considered a process heater. This is because the system operates by indirect heat transfer, with the burner heating the air for the dryer unit through a heat exchanger.

V. ONGOING ENFORCEMENT ACTION

The two existing feed dryers (Unit 651 and 661) that would be replaced by the proposed dryer system are the subject of a State enforcement action initiated by the Illinois EPA and carried out by the Illinois Attorney General's Office. PM emissions from these two existing feed dryers, as confirmed by emission testing conducted by MGP, have exceeded the limitations set in the construction permit issued for these dryers, Construction Permit 93080045. These limitations were set, based on information provided by MGP in its application, to limit PM emissions of these dryers to below the level at which construction and operation of these dryers would have been a major modification for PM under the federal rules for Prevention of Significant Deterioration (PSD), 40 CFR 52.21, i.e., a net emission of 25 tons per year or more.

The proposed installation of a new feed drying system to replace the two existing feed dryers is a project that MGP has proposed to undertake to resolve this violation. The Illinois EPA believes that a PSD permit that addresses PM emissions from this project, as is now being proposed to be issued, is needed for this project, as it would correct the violation by the existing feed dryers. However, the issuance of a PSD permit for this project now proposed by MGP is not considered sufficient to resolve the enforcement action. The parties continue to work on matters other than the technical resolution of the enforcement action, such as penalty, for which agreement must be reached for this enforcement action to be settled.

VI. PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

These PSD rules are relevant for this project because the MGP complex is located in a region whose air quality is classified as attainment for particulate matter as well as for other criteria air pollutants. The substantive requirement of the PSD rules for a major project, for each PSD pollutant subject to PSD, are: 1) A case-by-case determination of Best Available Control Technology (BACT), 2) An ambient air quality impact analysis to confirm that the project would not cause or contribute to a violation of the National Ambient Air Quality Standard(s) (NAAQS) or applicable PSD increment(s); and 3) An assessment of the impacts of the project on soils, vegetation and visibility. The Illinois EPA has been delegated authority by the USEPA to administer permitting under the federal PSD program in Illinois.

The proposed project is considered a major modification under the PSD rules for emissions of PM, as PM₁₀, as discussed above. In addition, this project is considered a major modification for PM₁₀ emissions because permitted emissions of the proposed feed drying system would be greater than the major modification threshold level (i.e., greater than 15 tons per year).

The proposed project is also being subjected to the BACT requirement of the PSD rules for VOM and CO emissions, as it is likely that the emissions of VOM and CO from the two existing feed dryers also have exceeded the levels at which these dryers constituted a major modification subject to PSD for these pollutants. This is based on information provided by USEPA on emissions from feed dryers at fuel ethanol facilities and USEPA's guidance on appropriate practices for

quantification of VOM emissions from feed dryers. This project is not subject to PSD for other PSD pollutants. In particular, the project's permitted annual emission of NO_x and SO₂ would both be less than 40 tons.

A. BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

MGP submitted a BACT demonstration in its application. Its proposed BACT determination reflected the BACT determination made for the earlier Eco-Dry™ feed drying system for which MGP was issued a construction permit in 2002. This action was based on MGP's review of the USEPA's *RACT/BACT/LAER Clearinghouse*, which did not reveal any other control technology determinations having been made for new feed dryers at fuel ethanol plants.

The Illinois EPA has made an independent determination of BACT. As explained below, the Illinois EPA concurred with MGP's selection of control technology as it reflected technology that is being used at the MGP plant and effectively controls emissions from feed drying. However, the Illinois EPA's determination of BACT for the proposed feed drying system, as set forth in the draft permit, would establish performance requirements for the technology that are more stringent than those proposed by MGP in its application.

The Illinois EPA has determined that the use of a control train that includes combustion-type control, such as Eco-Dry system, constitutes BACT for this project as required under the PSD rules. In addition to the material submitted by MGP, the Illinois EPA's determination of BACT relies upon other information about feed drying operations at other ethanol plants, including new drying systems at Aventine, Lincolnland Agri-Energy and Adkins Energy. The BACT emission limits for the new feed drying system are proposed to be set at 0.01 grain per dry standard cubic feet, 0.12 lb per million Btu, and 0.16 lb per million Btu for PM, VOM, and CO, respectively. These are considered stringent level of emission control based on the requirements and experience at other fuel ethanol plants.

Combustion control is effective for control of the fine PM, VOM, and any CO generated by the drying system. Combustion-type control, either by an oxidizer/boiler, regenerative thermal oxidizer, or other type of combustion device, as present with an EcoDry™ unit, is now recognized as an appropriate control technology for both direct-fired and indirectly heated feed dryers at ethanol plants. (See also Table 1.) Combustion control is effective for control of the VOM, PM and CO emissions that are generated by the feed drying process. The alternative drying systems to the type of feed drying system proposed by MGP would still rely on the effectiveness of combustion for control of VOM, PM and CO emissions and would not provide inherently different levels of emissions control from the integrated EcoDry™ system proposed by MGP. Rather these alternative drying systems would reflect differences in the overall approach that can be taken to the drying of feed and overall design of an ethanol plant, which can lead to either a simpler drying system accompanied by separate add-on control or a more more complex drying system in which control is an integral element of the dryer.

For VOM and CO, the control requirements for combustion systems for feed dryers have traditionally been set in terms of VOM control efficiency, e.g., 95 percent control. However, an approach based on control efficiency becomes less desirable as the complexity of the process streams controlled by the combustion system increase. In addition, as "design efficiency" of a dryer control system increases, a BACT limit expressed in these terms also relies upon a particular level of uncontrolled emissions from the unit. In addition, in this case, the combustion control system will control separate exhaust streams from the dryer and cooler units. Accordingly, the BACT performance requirement for the combustion system would generally be established in terms of some other parameter that is representative of the operating rate of the dryer system. This simplifies the future evaluation of possible BACT limit for a proposed drying system to the limits and emission rates that have been established and achieved by other new drying systems, especially as some plants ship some feed as wet cake without drying. If a dryer sees all the wet feed from a plant, such a BACT limit can be directly established in terms of the output of dry feed from the dryer in tons, so that BACT is expressed in lb/ton. However, the feed production at MGP will be split between two separate dryers, so that measurement of output in tons of feed is impractical. In its place, heat input to the dryer, which is also indicative of the amount of drying or moisture removal that has been performed, is proposed as the measure of dryer activity for the BACT limits for VOM and CO.

B. AIR QUALITY ANALYSIS

An air quality analysis for particulate matter was conducted by a consulting firm, August Mack Environmental Inc., on behalf of MGP to assess the impact of the emissions of the proposed project. Under the PSD rules, this analysis must determine whether the proposed project will cause or contribute to a violation of any applicable particulate matter air quality standards.

The required air quality analysis was performed using computerized dispersion modeling. The final analysis prepared for the project indicate that it will not cause a violation of the PM air quality standards or PSD increments, as the project will not have a significant impact on the region's air quality. The project's peak impacts are at most 1.47 $\mu\text{g}/\text{m}^3$ 24-hour average and 0.09 $\mu\text{g}/\text{m}^3$ annual average, compared to the significant impact levels of 5.0 $\mu\text{g}/\text{m}^3$ and 1.0 $\mu\text{g}/\text{m}^3$, respectively. This analysis conformed to the guidance and requirements of the USEPA and the Illinois EPA.

The above analysis for impacts of the new feed drying system by itself was accompanied by other air quality analyses that addressed MGP's overall impacts on regional air quality. These analyses were begun when MGP submitted an earlier proposal for corrective action for the existing feed dryers, which involved retrofit of wet electrostatic precipitators on the dryers. These analyses identified potential exceedances of the 24-hour average daily PM10 air quality standard in the immediate vicinity of the

plant if all of MGP's existing emission units were operated at the emission rates then allowed. Various actions have been and are being taken by the Illinois EPA and MGP to respond to the results of these analyses and protect the area's air quality for PM. The Clean Air Act Permit Program (CAAPP) permit issued to the plant in November 2003 tightens the limits on PM emissions from most of the units contributing to the modeled exceedances. In August 2004, MGP obtained a Construction Permit to increase the heights of the stacks of two gluten dryers at the plant whose emissions are controlled with baghouses but are currently subject to downwash due to inadequate stack height. Finally, the proposed new feed drying system would replace the two existing feed dryers, which would be removed from service.

C. IMPACTS ON SOIL, VEGETATION AND VISIBILITY

The project should not adversely impact soil, vegetation or visibility. This is because the maximum air quality impacts predicted for both NO_x and SO₂ emissions from the project are de minimis, so that existing air quality should not be affected measurably by this project.

VII. PERMIT CONDITIONS

The conditions of the permit set forth the air pollution control requirements that the project must meet. These requirements include the applicable emission standards that apply to the project. They also include the measures that must be used and the emission limits that must be met as BACT for emissions of PM from the new feed dryer.

The permit also establishes enforceable limitations on the amount of emissions for which the project is permitted. Limitations are set both for PM for which the project is major, and for pollutants for which the project is not major. In addition to annual limitations on emissions, the permit includes short-term emission limitations and operational limitations, as needed to provide practical enforceability of the annual emission limitations. As previously noted, actual emissions associated with the project would be less than the permitted emissions to the extent that the facility operates at less than capacity and control equipment normally operates to achieve emission rates that are lower than the applicable standards and limitations.

The permit also establishes appropriate compliance procedures for the ongoing operation of the new feed drying system, including requirements for emission testing, required work practices, operational monitoring, recordkeeping, and reporting. These measures are imposed to assure that the operation and emissions of the new feed dryer system are appropriately tracked to confirm compliance with the various limitations and requirements established for the new system.

In addition, the permit would contain conditions linking the installation of the proposed feed drying system to actions required with the two existing gluten dryers to protect ambient air quality. For this purpose, MGP must either complete the increase in stack height for these dryers or .

VIII. REQUEST FOR COMMENTS

It is the Illinois EPA's preliminary determination that the proposed project meets applicable state and federal air pollution control requirements. The Illinois EPA is therefore proposing to issue a construction permit for the project.

Comments are requested on this proposed action by the Illinois EPA and the conditions of the draft permit.

Table 1: Review of Control Options for the Proposed Feed Drying System

Control Technology	Feasibility	Effectiveness		
		PM	VOM	CO
Combustion	Yes	Yes - High	Yes - High	Yes - High
Scrubbing	Yes	Yes - Moderate ²	Yes - Varies ³	No
Filtration	No ¹	-	-	-

Notes

1. The nature of the PM emissions from feed drying, which is "sticky" and hygroscopic, combined with the high-moisture content of the exhaust stream, make filtration infeasible or impractical for control of the proposed feed drying system.
2. Scrubbing is not as effective for control of the fine organic particulate from drying of feed at an ethanol plant as combustion.
3. The effectiveness of scrubbing depends on the solubility in water of the specific compounds that are being controlled. Scrubbing also poses more complex concerns for maintaining proper operation of a unit, which are not present with combustion. In circumstances where organic compounds in the emissions are not being recovered, such as control of the exhaust from a feed dryer, combustion provides high efficiency and simple, reliable operation.